

WHAT IS CLAIMED IS:

1. A pseudotyped retrovirus virion comprising a Lymphocytic Choriomeningitis Virus (LCMV) strain WE-54 envelope glycoprotein.
- 5 2. The pseudotyped retrovirus virion of claim 1, wherein the envelope glycoprotein comprises a phenylalanine at residue 260.
3. The pseudotyped retrovirus virion of claim 1, wherein the envelope glycoprotein comprises a phenylalanine at residue 153.
- 10 4. The pseudotyped retrovirus virion of claim 1, wherein the envelope glycoprotein comprises a phenylalanine at residue 260 and a phenylalanine at residue 153.
- 15 5. A pseudotyped feline immunodeficiency virus (FIV) virion comprising a envelope glycoprotein from Lymphocytic Choriomeningitis Virus (LCMV).
6. The pseudotyped FIV virion of claim 5, wherein the LCMV is strain WE-54.
- 20 7. The pseudotyped FIV virion of claim 6, wherein the envelope glycoprotein comprises a phenylalanine at residue 260.
- 25 8. The pseudotyped FIV virion of claim 6, wherein the envelope glycoprotein comprises a phenylalanine at residue 153.
9. The pseudotyped FIV virion of claim 6, wherein the envelope glycoprotein comprises a phenylalanine at residue 260 and a phenylalanine at residue 153.
- 30

10. An isolated vector comprising a nucleic acid encoding an envelope glycoprotein from Lymphocytic Choriomeningitis Virus (LCMV) strain WE-54.
- 5 11. The vector of claim 10, wherein the envelope glycoprotein comprises a phenylalanine at residue 260.
12. The vector of claim 10, wherein the envelope glycoprotein comprises a phenylalanine at residue 153.
- 10 13. The vector of claim 10, wherein the envelope glycoprotein comprises a phenylalanine at residue 260 and a phenylalanine at residue 153.
- 15 14. A method of producing in the form of infectious particles a transgene vector containing a remedial gene, comprising transfecting a cell with  
(a) a packaging vector;  
(b) a vector according to any of claims 10-13, and  
(c) a transgene vector comprising the remedial gene and a functional packaging signal, which by itself is incapable of causing a cell to produce  
20 transducing vector particles,  
wherein the cell produces infectious transducing vector particles comprising the transgene vector in RNA form, a Gag protein, a Pol protein, and a pseudotyped envelope glycoprotein.
- 25 15. A method of delivering a remedial gene to a target cell *in vivo*, comprising producing viral particles by the method of claim 16 and then infecting the target cell with an effective amount of infectious transducing transgene vector particles.
- 30 16. The method of claim 15, wherein the target cell is an airway epithelia cell, a central nervous system cell, or a hepatocyte cell.

17. A method comprising inserting an LCMV envelope glycoprotein into a lipid vesicle, and electroporating plasmid DNA into the lipid vesicle.
- 5 18. A packaging cell line comprising an inducible expression nucleic acid sequence comprising a polynucleotide encoding an LCMV-WE54 envelope glycoprotein.
- 10 19. The packaging cell of claim 18, wherein the envelope glycoprotein comprises a phenylalanine at residue 260.
20. The packaging cell of claim 18 wherein the envelope glycoprotein comprises a phenylalanine at residue 153.
- 15 21. The packaging cell of claim 18, wherein the envelope glycoprotein comprises a phenylalanine at residue 260 and a phenylalanine at residue 153.
- 20 22. The packaging cell of claim 18, further comprising a transgene vector.
23. The packaging cell of claim 18, wherein the transgene vector comprises a remedial gene.
- 25 24. A method of producing in the form of infectious particles a transgene vector containing a remedial gene, comprising transfecting a packaging cell of claim 18 with
- (a) a packaging vector, and
- (b) a transgene vector comprising the remedial gene and a functional packaging signal, which by itself is incapable of causing a cell to produce
- 30 transducing vector particles,

wherein the cell produces infectious transducing vector particles comprising the transgene vector in RNA form, a Gag protein, a Pol protein, and a pseudotyped envelope glycoprotein.

- 5           25. A kit comprising a vector according to any of claims 10-13, and a  
transgene vector comprising a functional and compatible packaging signal,  
the transgene vector being incapable by itself of causing a cell transfected  
by the transgene vector to encapsulate the RNA form of the transgene  
vector into a retroviral particle comprising an LCMV-WE54 envelope  
10           glycoprotein.
26. The kit of claim 25, wherein the LCMV-WE54 envelope glycoprotein  
comprises a phenylalanine at residue 260 or a phenylalanine at residue  
153, or a phenylalanine at both residue 260 and residue 153.
- 15           27. A method of treating an airway epithelial cell, wherein the airway  
epithelial cell has an apical surface and a basolateral surface, comprising  
administering to the apical surface of the airway epithelial cell a  
Lymphocytic Choriomeningitis Virus (LCMV) strain WE-54 pseudotyped  
20           vector.
28. The method of claim 27, wherein the airway epithelial cell is a human  
airway epithelial cell.